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# Conceptual Math for the Math-Anxious Teacher

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# Conceptual Math for the Math Anxious Teacher

*This PLM works best in Google Chrome.*

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## About This PLM

Math teachers have a hard time teaching students how to conceptualize math (Ballantyne, 2019). In this Professional Learning Module, the teacher will learn how to address conceptualizing math instruction in their classroom. This module explores concepts supporting conceptual instruction from middle-Elementary level to lower-Secondary level math. Teachers will deepen their understanding of the mathematical practices, mathematical proficiency, and productive struggle. Additionally, this module will focus on teachers' understanding how to guide students to think conceptually, while giving students appropriate levels of classroom rigor. Teachers will deepen their understanding of the North Carolina Mathematical Standards through activities building conceptual tasks in each Mathematical domain. Finally, teachers will learn how each mathematical domain is vertically aligned to the course they teach. We help you teach not just *how* the math concept works but *why* they work so students are empowered to engage!

Key words: *Math Anxious, Conceptual Math, Math Proficiency, Vertical Progressions, Rigor, Productive Struggle.*

## Goals and Objectives

The **Goals** of this professional learning module are:

- to give math teachers tools to help students learn math concepts more readily.
- to assist math anxious teachers in building their own conceptual confidence.

The **Objectives** are:

- help teachers think of how deeper understanding of math concepts builds schemas
- help teachers define what math proficiency is, what it looks like.
- show ways to increase rigor in the classroom, without just making it harder (Boaler, 2016).
- show how to increase productive struggle - for students (Boaler, 2016; Dweck, 2016).
- show how skills connect vertically across grade levels (achievethecore.org, n.d.)
- to show how lower-level skills impact future skills and where misconceptions occur (Siegler et al., 2012)

- show how to build conceptual understanding of key mathematical concepts: the Number System, Expressions & Equations, Geometry, and Ratios and Proportions, so students can apply these core concepts in higher level math situations. (Siegler et al., 2012)

## Alignment to Standards

This Professional Learning Module closely aligns to North Carolina Teaching Standards 3 and 4.

Standard 3: Teachers know the content they teach

- Teachers will be able to implement tasks focused on students understanding conceptual processes rather than procedural processes (Module 2).
- Teachers will select a specific domain according to their content and look at the vertical alignment along with the North Carolina Mathematical Standards (Module 4).
- Teachers will learn how to identify mathematical proficiency, how to implement conceptual tasks, and create appropriate classroom rigor for the five North Carolina Mathematical Standards domains (Modules 5-8).

Standard 4: Teachers Facilitate Learning for Their Students

- Teachers will understand the Mathematical Practices and how they apply to Mathematical proficiency (Module 1).
- Teachers will understand how to implement tasks that create conceptual understanding (Module 2).
- Teachers will create critical thinking and problem-solving skills through conceptual understanding (Module 2).
- Teachers will implement lessons with appropriate classroom rigor (Module 3).
- Teachers will work together to understand vertical alignment for various Mathematical domains (Module 4).

## Course Outline

There are eight (8) Lessons:

- Module 1: Math Practices; defining Math Proficient
    - Teachers will learn about the five components of Mathematical proficiency.
- Module 2: What is conceptual math?
    - Teachers will learn how to focus on teaching students why process work rather than how to perform the process.
- Module 3: Rigor in Math
    - Teachers will learn about the difference between “harder” and “rigorous”.

    - Teachers will learn how to help their students throughProductive Struggle
- Module 4: Vertical Progression
    - Teachers will learn how to connect mathematical concepts both up the standards and understand what skillsets are built in previous grade content standards.
- Module 5: Expressions & Equations
    - Teachers will learn how to use algebra tiles to conceptually teach solving equations
    - Teachers will learn how conceptual learning can make learning about linear equations engaging.
- Module 6: Ratios & Proportions
    - Teachers will learn how to use fraction tiles to conceptually teach fraction operation.
- Module 7: The Number System
    - Teachers will learn about the number system, including natural, real, rational, and irrational numbers.
    - Teachers will learn how to use manipulatives to represent integers in the number system.
- Module 8: Geometry
    - Teachers will learn how to make lessons engaging and hands-on to help students learn geometry conceptually.

**Ideas on HOW to Navigate this PLM**

Teachers (Independently)

- Can spend as much or as little time working through each lesson as the teacher sees fit
- When breaking this PLM up into clusters, it is suggested to break up by foundational theories (learning modules 1-4) and content areas (learning modules 5-8)
- Can work on PLM over the course of time (*maybe incorporate it into the teacher's Professional Development Plan for the year).* It is okay to start and come back!
- Can use parts of the PLM for targeted areas of growth

Teachers (PLC)

- Work through PLM during designed times
- If breaking this PLM up into different sessions, it is suggested to focus on one module at a time but to complete the entire PLM within one school year
- Use PLM as a whole over a period of time
- Use specific learning module to target areas of needed growth
- Use resources to implement conceptual learning activities by domains

Teacher Leaders/Administrators

- Can present parts of PLM to PLCs or teachers according to areas of need to promote teacher growth
- Can utilize research and resources to develop/revamp district resources

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